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ABSTRACT

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REFERENCE SERVICE

IN THE

INFORMATION NETWORK

A Paper for the Interlibrary Communications and Information Networks Conference, 1970.

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Abstract

Reference service is defined as the mediation by a librarian between the need structures of users and the structures of information resources. The general process by which reference librarians accomplish this is outlined as including the phases of question clarification, question translation, search strategy formulation, search execution, delivery of information, and relevance evaluation. The impact of network development on each of these phases is discussed. The use of communications technology is viewed as a means for improving the interactive nature and response time of network reference service. Research into information and its use, as a basis for network reference service development, is urged.

Introduction

Jesse Shera has defined reference service as the mediation by a librarian between two sets of structures, the need structures of users and the structure of information sources available to satisfy these needs (47, p. 13). This paper will discuss such service within the context of the information network. The first section below will outline the main phases of the process that has been developed over the years by reference librarians for the performance of reference service. This will be followed by a discussion of the impact that the development of multi-library systems has had and that future network development might have on the reference process, along with mention of problems to be solved, directions that their solutions might take, and needed research. A final brief section will summarize the paper and offer the author's opinions on research that is most needed.

The Reference Process

Rees has written that the "inability of questioners to formalize their information needs lies at the heart of the reference process" (43, p. 59). This is a well-known phenomenon, which has been discussed at length in the literature. Such inability is attributable to many factors, most of them as yet not clearly understood. It is very difficult for one to express what he does not know. Also, library users often do not know the extent of the information that can be brought to bear on their questions by the library. Both Taylor

and Lancaster point out that patrons will frequently present questions that are over-formalized, that is, questions that represent what the users think the system can given them rather than what they really need (49, p. 9; 30, p. 111). Thus, a very early phase of the reference process is the exploration and attempt to improve the congruence between the stated question and the real information need of the patron.

Reed calls this phase the "Librarian/questioner dialogue" (43, p. 58); Taylor referens to it as "question negotiation" (49); and many writers in traditional reference literature have called it the "reference interview." The appropriate aim of this part of the process seems to be two-fold. One is to get a clear, narrative natural language statement of the user's information request (30, p. 111). The other is to gather a number of facts and clues to be used to amplify or refine this statement. For example, there are a number of personal characteristics of the questioner that will affect the kind of information he might find useful. Also, knowledge of the anticipated use of the information requested can help the librarian refine the ultimate search. Lancaster found this latter to be particularly true for the MEDLARS system (30, p. 116). Depending on the nature of the particular reference situation and the information requested, there are other such facts that may usefully be gathered or noted (49, p. 13-19).

The success of this phase of the reference process rests on the knowledge and skill of the reference librarian. A good part of this skill is skill in human communication, including the requisite

sensitivity and preceptivity. Also important is his general knowledge of information users and the uses to which information is put. The librarian must have knowledge of the range of information that is available to satisfy the user's needs, in order to know the dimensions along which the initial question should be negotiated or explored for clarification. Taylor has found that the subject knowledge of the librarian and the questioner's perception of the librarian's expertise are important to the question negotiation phase (49, p. 9).

As this clarification phase is going on, and based on its outcome, another phase of the reference process is taking place. This is what might be called a translation phase. In this phase the natural language question and the elaborating facts and clues are transformed into a characterization of the information needed in the technical and formal terms of the information system (46, p. 29). Having a clear understanding of the information need from the user's point of view, the librarian must translate the request into a characterization of the information from the conceptual and organizational point of view of the librarian and the information system.

This phase seems also to have two components that are interrelated with each other and with the other phases of the reference process. The first of these components is the analysis, classification, or categorization of the question along various dimensions (9, p. 47-48). For example, the question is categorized by subject, by the type of information needed (e.g., brief fact or statistic, synthesized or critical review, methodological discussion, etc.), and

perhaps by a potential category of answering documents (e.g., handbook, monographic treatise, etc.), depending on how the librarian knows and views the contents of the system.

The other component of the translation phase of the reference process is that of actually choosing terms from the control and access language of the information system to represent the information need of the patron (46, p. 29, 32). Lancaster has characterized this as indexing the question in a manner similar to the indexing that has been done on the documents that might eventually answer the question (31, p. 5).

The outcome of this phase is what Taylor has called the "compromised" question, that is a representation of the inquirer's need within the constraints of and in the terms used by the system and its files (49, p. 9). It is tempting for the librarian to attempt to combine this phase with the first phase and to help the patron translate his information need directly into the terms of the system. However, Taylor points out that "the compromised question is the information specialist's business . . ." (49, p. 9), and Lancaster makes the point strongly that the subject term list of the system should be used only <u>after</u> a clear natural language statement of the question has been obtained (30, p. 111-15).

The success of this phase of the reference process rests on mechanisms provided by the system to assist the librarian, as well as upon his knowledge and skill. Such things as subject heading

lists, cross-reference outlines, and the like can aid this process greatly, as can the availability of bilbiographic devices to accommodate preliminary searching that might be done to assist in translating the question (20, p. 348). Also very crucial is the knowledgeability of the librarian concerning the subject indexing languages of the system, the organizational arrangements of the information store, relationships between the contents of various types of material, etc (9, p. 65-67).

A third phase of the reference process is that of formulating a search strategy to guide the search for the information. The previous phase might be said to constitute a specification of where (conceptually) in some structured body of information the answer to a question resides. This phase represents the design of a plan for getting to that location and for retrieving the information. The nature of this phase is greatly affected by the nature of the specific information system. In some systems the strategy involves devising a search for only citations to potential answering sources. In other systems there is a predominance of strategies where information itself is sought directly, as in a collection of reference books. Finally, the search strategy in some systems includes both the identification of citations to potential answering sources and the retrieval and exploitation of these sources.

In mechanized systems the design of the system places fairly strict constraints on the search strategies to be used for retrieving information. There is a large literature on search strategies, both

from the point of view of the system designer and of the searcher. In manual or more traditional systems the formulation of search strategies by reference librarians seems to take place primarily at the subconscious level (9, p. 43). The process seems to be one of identifying potential answering document classes, weighing their relative probability of supplying the answer, assessing the procedure necessary for retrieving documents (e.g., use of the library catalog, use of periodical indexes, direct browsing of the shelves, etc.), and deciding on the order in which search steps (at least the initial or major ones) will be taken. One standard text says that this is a process of forming a series of hypotheses as to the probable answering source, which are tested in the search (26, p. 30-32).

The next phase of the reference process to be mentioned is the conduct of the search itself. Lancaster distinguishes between "browsing" searches and "one-chance" searches (31, p. 181-82). The former, whether personally conducted by the user himself or delegated to the librarian, is characteristic of the traditional library operation and points up the complex and dynamic relationships among the various phases of the reference process. This type of search is often begun with only a minimal preparation of a formal search strategy, and even that search strategy (as well as the terms into which the question has been translated) is modified and guided by the information found as the search progresses. When the librarian conducts the search he seems to browse on behalf of the requester, making relevance judgments based on his perception of the user's needs (31, p. 181-82; 43, p. 59). The "one-chance" search is typical of the non-interactive

mechanized system, where a search is formulated and then delegated to the computer to be carried out, with no chance for browsing or changing the search as it progresses. If the completed search is not successful, a modified strategy must be formulated and another search conducted.

If the search produces useful information, the reference process includes the phase of delivering the information to the user, including any interpretation, condensation, integration, or other "repackaging" performed by the librarian. The amount of this latter component that is performed is usually a policy matter of the library. It also depends on how much the user trusts the librarian's ability to do such work. Depending on the library, the answer can be delivered as a simple verbal answer, as a bibliography (with or without annotations or abstracts), in the form of one or more documents known or expected to contain the answer, or as an integrated report based on several sources.

Throughout the reference process, as outlined above, relevance predictions and judgments have been made. The final phase of the process to be discussed, then, is that of the assessment of the relevance of information to the requester's needs. In searches where there is little interaction between the librarian and the user during the search, this phase has two fairly distinct components. As the search progresses, the librarian makes judgments concerning the relevance of the information found to the information request negotiated or agreed to by the user and the librarian. Then, at the

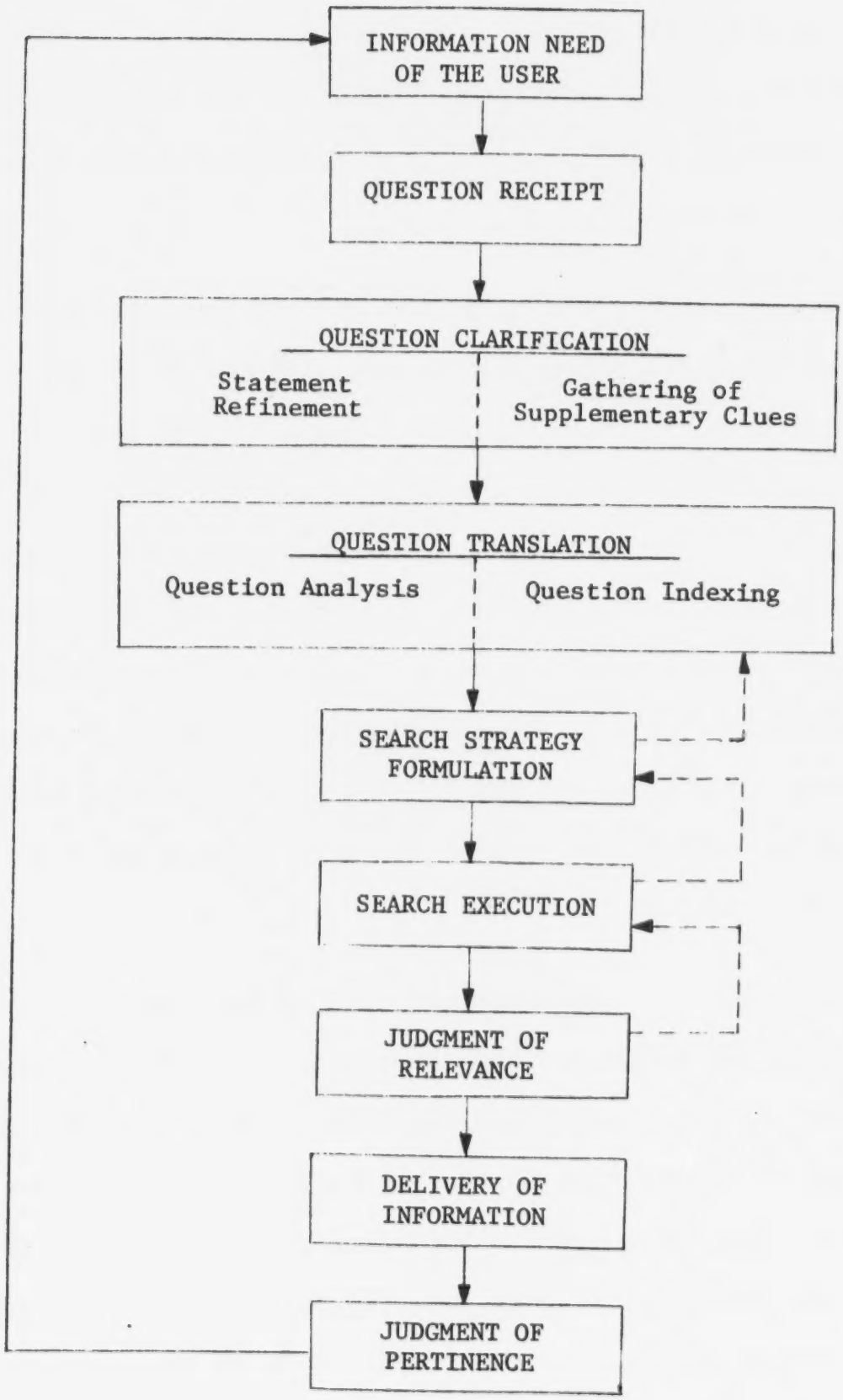

Figure 1. Major Phases of the Reference Process

end of the search the requester is asked to judge the information produced as to its relevance to his actual information need. Shera and Rees call the former the evaluation of relevance and the latter evaluation of pertinence. They point out that it is possible for an answer to be entirely relevant to the question put to the system and yet not at all pertinent to the user's real need (46,p. 29). In a system where the patron and librarian interact throughout the reference process, these two types of judgment are not so distinct, since the librarian's and user's judgment can be made together.

Though not really a part of the reference process, in the narrow sense of the term used here, it is very important that the results of the relevance and pertinence judgments be used in the evaluation and improvement of the reference or information system. The reference librarian is a key figure in this feedback process. There is, of course, a very large literature on information system evaluation, and a summary of it here would be inappropriate.

Interactive Mechanized Systems

The above discussion has been couched in terms of the necessity for human mediation by a reference librarian between the user and the information system. There is currently a great deal of research being done on interactive, question-answering information systems where the functions outlined above are to be handled by man-machine interaction (35, p. 228-29; 44; 7). At the present time, most such systems in existence seem to be experimental or developmental and to be based on relatively small data bases. One operational system that is not fully

interactive but which does have a large data base and on-line search formulation dialogue capabilities is the SUNY Biomedical Communications Network (8), which will undoubtedly be described in other papers for this conference.

For a number of reasons, it would seem that the interactive mechanized system will not obviate the need for the reference librarian in the network for some time. For one thing, the network is likely to be composed of a number of sub-systems, each containing a different type of information with its own file configuration and indexing language. For example, a study for the Far West Laboratory for Educational Research and Development concluded that organization and operation of a single system which would incorporate all sources of information in education and would use one indexing system is not feasible in view of the present state of the taxonomy of educational information (23, p. 28). Thus, even if wide-spread development of interactive systems based on various data bases were to come about, it would seem that some human mediation would be necessary to help the user choose between appropriate components of the network, according to his information need.

In the SUNY Biomedical Communications Network the assistance of a reference librarian is frequently sought by users, and it is expected that this will continue to be the case (8, p. 106-07). Project Intrex proposes that in the interim before the ultimate interactive system exists (an interim that Salton sees as a long one (44, p. 412-13)) the command "HELP" should connect the user to

a human reference librarian (39, p. 98). Garfield, Amey, and Rees all argue for the continued necessity of human mediation in mechanized information systems (20; 43, p. 64; 3, p. 13). Thus, it is the contention of this paper that rather than replace the reference librarian, on-line interactive systems can be used in the network to support and improve the human reference librarian's performance. Support for this contention will be developed in various paragraphs of the remainder of the paper.

The Effects of Network Development

The development of multi-unit library systems has had striking effects on reference service, and future network development will cause further changes. One of the most dramatic such effects is the provision of legal access to greatly augmented sources of information at the local level. This has been the major raison dêtre of library system development, is its most mature aspect, and will undoubtedly be discussed in detail by various other papers for this conference. While the major attention in the literature has been given to the various arrangements whereby the collections of other, usually larger or more specialized, libraries and information centers are made accessible to local libraries, another aspect of augmented information availability is likely to assume increasing importance in the future. This is the expansion of resources resulting from the fact that the larger financial base of the network can facilitate acquisition or provision of access to information sources previously too costly for any of the individual units, and that the widened base of user groups that comes with network development can justify provision of information

services previously considered uneconomic by individual units (in addition to the fact that sometimes need for or existence of them was previously unknown to the local units).

An example of the possibilities of this latter aspect of network information ability is access to the increasing amount of information available in machine-readable or machine-manipulatable form. Either as a by-product of the regular publishing process, or as specifically converted for information system use, very large amounts of document text and raw data in such forms are becoming available for analysis and retrieval. For example, the New York Times organization has announced plans to offer mechanized access to a vast amount of information from its files (18); the availability of such sources as the Chemical Compound Registry, census data, and manufacturers catalogs in machinable forms is widely known; and Project Intrex plans include experimentation with a computerized handbook based on machinable text (39, p. 59). Social sciences data archives, containing largely machine readable data, are the subject of another paper for this conference. Certainly the expanded financial and user group base of networks are going to be necessary for the effective exploitation of these sources.

Of more immediate importance, perhaps, than some of the developmental sources mentioned above are the many sources of bibliographic information presently available in digital form. In addition to the more frequently mentioned examples of organizations offering machine-readable bibliographic records, such as Chemical Abstracts Service,

BioSciences Information Services, Engineering Index, Inc., and Institute for Scientific Information, The Committee on Scientific and Technical Information lists as examples some 18 services by 11 private organizations and seven governmental agencies (35, p. 222-24), and a committee of the ALA has compiled a directory to the data bases of some 18 organizations (2). Russell Shank has pointed out that attention must be given to the exploitation of such resources by libraries to avoid excluding potential users who lack extensive financial backing from very important sources of information (45, p. 273). Networks would seem to be the natural mechanism for such exploitation, perhaps through the services of such "retail" processing and program development services as are being developed at IIT and the universities of Georgia, Iowa, Louisville, and Pittsburgh (27; 28; 29).

Another important type of information source that networks can make more widely available is that of human and institutional resources, i.e., information residing in the minds of people, such as consultants, subject specialists, experts, and agencies. Existing multi-library systems with extensive reference services have discovered the importance of this type of source (12; 22). A particularly interesting example of the potential in this area is the Medical Communications Center at the University of Wisconsin Medical Center, through which doctors out in the state can dial some 200 brief and up-to-date presentations by experts on problems confronted in day-to-day practice. Also, the Center offers regularly scheduled telephone/radio conferences on important and timely topics (34). It has been pointed out that the present invisible college information exchange

system discriminates against those who are isolated, young, not well established in their profession, or simply not aggressive (13, p. 14). Efforts by the network to exploit personal sources of information can mitigate such discrimination.

To summarize and to say over again what has been said repeatedly in the literature, the network can offer the needer of information, through a convenient local outlet, the whole range of information sources that have been developed nationally to serve information needs. The task of network designers, it would seem, is basically to build into the network the generalist ability for each node to put all requesters into effective contact with information appropriate to their needs, while encouraging the development of node specialization (so that each node can handle locally the optimum percentage of the needs of its unique user group, whether geographic or subject, and can contribute meaningfully to overall network strength). This implies, among other things, that the "democratization of information" should not result merely in a leveling of information resources but in the protection and strengthening of major resources while making them readily available (5, p. 5).

The mediation between this vastly augmented store of information and the patron with his individual needs will be performed by the reference librarian using the same basic process as that outlined in the early part of this paper. The next part of the paper will discuss the effects on this process that network development might have. The discussion will proceed by discussing each phase of the reference

clarification phase. Amey has pointed out that the Socratic method of perceptive dialogue between human beings is universally acknowledged to be the most effective means for clarifying information requests (3, p. 13). However, it will undoubtedly remain the case for some time to come that many library outlets are not staffed with personnel having the knowledge and skill necessary to accomplish this successfully.

There would seem to be three basic approaches to the solution of this problem in the network. One is to use written instructions on a request form to guide the user in formulating a clear statement of his request and in giving other indications of his information need. Lancaster has emphasized the importance of this approach in the MEDLARS system (30, p. 193). Another approach is for the network to offer programs of in-service training to help lower-node staff to gain the skill necessary for helping users to clarify their requests. While there is little literature on this subject, the author's experience and conversations with librarians indicate that current practice emphasizes a combination of these two, with attempts being made to improve request forms and to train personnel in their use. Finally, the rapid communications apparatus of the network can be used to put the user into direct contact with a higher node for dialogue with a properly knowledgeable librarian. Gaines suggests this approach in the metropolitan network (19, p. 43). While it would seem that this would be the most effective approach, where communication costs permit it, more research on the matter is needed. Lancaster, for example, argues the necessity of a written statement even when a librarian is available

process in terms of the impact that network development will have on it and problems that need solution.

Verner Clapp has argued the desirability of libraries having the qualities of simplicity in their appeal or functions and conspicuity in their availability (10, p. 106-07). Network development might permit this if every one of the many library outlets becomes simply a place to which one can turn when in need of information of any sort. Even the beginnings in this direction made so far mean that the librarian in a given local outlet is confronted with a greatly broadened spectrum of information needs to mediate. On the other hand, it can also mean that the patron has not had to choose on his own among the bewildering variety of different types of libraries, each willing to handle a different narrow range of information needs. Thus, perhaps relatively fewer patrons will come to the reference situation with requests alrady over-formalized by the process of having to make ill-informed judgments as to what various libraries will and will not do. Also, if network development results in a new (more positive) view of the library as a place to go for information service of all kinds, as anticipated by Becker and Hayes (5, p. 6), fewer over-formalized questions resulting from lack of confidence in the library's and the librarian's ability should be the case.

One of the most complex problems of network design is that of determining at what node levels the various phases of the reference process should be carried out. This is certainly true of the question

for consultation (30, p. 193). In any case, the effectiveness of this phase is hampered by our incomplete and imprecise knowledge of the relation between user characteristics and information needs, so that it is difficult to know which user characteristics are important to note, either personally or on a written form.

At whatever node question clarification occurs, it requires, on the part of the librarian, knowledge of the wide range of information available and the ability to use such knowledge to help the patron clarify his request. Presently, gaps in such knowledge (gaps that are understandable in view of the magnitude of potential sources) inhibit the effectiveness of the reference librarian (43, p. 62). It is here that the on-line, interactive feature of components of the network can be of great assistance to the librarian. The librarian can use interaction with the various components to augment his knowledge of network resources and thus enhance the clarification process. For example, knowing quantitatively the amount of material in the store relating to a question as initially stated can have a dramatic effect on its re-statement (32, p. 68-69).

The translation phase of the reference process will also be greatly affected by network development. In the single-unit situation, where the librarian is fairly familiar with the materials available, he tends to translate the question into document classes with answering potential, or even into one or more potential documents. In the network, where the information sources are of all types and formats, it would be preferable for the librarian to think in terms of the

information needed, rather than in terms of formats or documents. This requires, on the part of the librarian, a type of knowledge of information that is not well developed in the profession at large and which must receive increased attention.

Even in the single library, one of the most important skills required of the reference librarian is the ability to move from one indexing system language to another, such as from the library's catalog to various periodical indexes, bibliographies, etc. The importance of such translation skill is increased greatly by the network, with its multiplicity of sub-systems, each with its own indexing language and system constraints. A number of network capabilities can assist the reference librarian in this area. For those components of the network that have been computerized and with which the librarian can establish on-line contact, he can call up displays of term relationships, language structures, etc. For manual or off-line components, thesauri or subject heading lists are invaluable. Also, with the increasing prevalence of user-oriented information services for very specific user groups, such as information analysis centers, the translation process can sometimes be one of placing the requester in the appropriate user group and referring his question to one of these services for further processing and answering.

This brings up the matter of the approrpiate node at which the translation phase of the reference process should take place. Lower-node staff often lack the broad knowledge of information resources necessary for adequate translation. Also, the bibliographic resources

available at local nodes are often quite limited. Thus, if the translation phase is carried out at the lower network nodes, it often results in the transmission of overly narrow or otherwise inadequate requests to higher levels. On the other hand, higher nodes, which have the requisite bibliographic resources, often lack the manpower necessary to service the inquiries from other nodes (11, p. 8). In addition, the staff of libraries at higher levels often lack the familiarity with the needs of special user groups that is necessary for adequate translation of questions from other types of libraries (45, p. 271).

This problem has been attacked by networks from a number of angles. An early solution attempted has been to supply referring libraries with bibliographic tools, such as subject bibliographies, union lists and catalogs, and the like. As Clapp points out, this allows the facilities of one library to be extended to the patrons of another without the diversion of the reference manpower of the first (11, p. 9). However, this still requires knowledge and skills sometimes not available at the lowest nodes of the network. Another response to the problem has been to have a designated node in the network receive untranslated questions, translate them with the use of skilled staff and bibliographic resources, and transmit the translated requests to appropriate answering nodes. This is typically a function of the state library agency in statewide public library systems.

Still another approach is to have additional staff added to the nodes of the network having substantial resource strength. This staff can include members familiar with the needs of the user groups with

which the requests have originated. Since these staff members often not only translate a reference request into a more formalized statement, but also formulate search strategies and carry out other phases of the reference process, further discussion of this mechanism will be delayed.

The author's experience and contacts with library system personnel have shown that even the most skilled staff is at a disadvantage in translating the question when it is done away from the patron. Again, the communications capabilities of the network need to be used to put the patron into contact with the skilled reference librarian so that they may interact through the early phases of the process. On the other hand, it would seem uneconomic routinely to have the patron in interactive contact with network nodes at great distances. What will most likely be the case will be regional concentrations of staff skill, bibliographic resources, and communications capabilities. At these regional centers appropriate portions of the reference process will be performed by the reference librarians in interaction with the user, and the remainder will be performed by the reference librarians, on behalf of the user, in interaction with the rest of the system (in those cases where the need cannot be satisfied from local or regional resources).

In any case, translated questions will undoubtedly be transmitted from one node of the network to another. It is important that the language used in such transmission deal with very basic information and user-need categories and concepts, rather than with the overly

narrow format and document categories presently typical. Unfortunately our present knowledge of information and its use does not facilitate this approach.

The formulation of the search strategy and conduct of the search for information is a very complex phase of the reference process in the network. It is at this point where the librarian must devise a strategy to exploit most efficiently and effectively the broad range of resources in the network to serve the user's need. One of the most serious inadequacies in present network development is the lack of knowledge on the part of network librarians concerning the resources available in the network and the constraints surrounding their availability (45, p. 270). Networks are attempting to solve this problem by instituting directory services. For example, the METRO network in New York City has established the Central Advisory and Referral Service (CARES) which provides member institutions with information about library resources in the metropolitan area. It publishes catalogs and directories, gives verbal information, and assists librarians of member institutions in developing search strategies on behalf of their users (14). In addition, this center has established liaison with directory and referral services at the national level (41, p. 184). Other multi-unit systems have established similar services.

As mentioned above under question translation, concentrations of resources and staff with the skill to exploit them are very important to the formulation and execution of searches in network

operations. This can be accomplished in a number of ways. Large or specialized libraries can simply accept the responsibility to serve the needs of users of other libraries and augment their staffs and resources as needed. This seems to be the case with the Indiana Biomedical Information Program, wherein the Indiana University School of Medicine Library is part of a statewide teletype network which allows biomedical requests to be referred to this library from local public libraries (21). The Countway Medical Library is the locus for intellectual strength in a medical library network in New England (25, p. 331). The financial strength offered by network development can be used to compensate these resource centers for the additional staff time and resources required, so that service to their primary clientele is not diluted.

Another approach is to have network personnel housed in the resource center, so that they may use the resources of the center in an interactive way to formulate and executive searches. For example, in 1964 a Technical Information Center opened at each of four major public libraries in Tennessee, where qualified librarians handled requests relayed from other libraries (36, p. 173). The Wayne County Intermediate School District maintains an office in Wayne State University's Education Library (42, p. 61), and the Chicago Public Library houses system staff of a suburban multi-library system (37). Finally, specialized regional information centers can be created for the purpose of formulating and conducting searches. Such a center is the Regional Information System of the Michigan-Ohio Regional Educational Laboratory (MOREL) (24). This center does not possess

extensive stores of actual information, but is composed of searching tools necessary to identify and locate such information on request. This and other such centers have been called "switching centers," a concept which is the subject of another paper for this conference.

In present network operations, with their inhibitions and inabilities to utilize rapid communications technology fully, the formulation and execution of the search is typically delegated by the librarian at a lower node to personnel at the resource center or switching center and is often further delegated to a specialized information source for actual search. Thus, for the librarian at the lower node this search is much like the "one-chance" search of the mechanized system. As is well known, this situation leads to frequent relevance and pertinence problems. There seem to be two interconnected approaches to the solution of this problem. One is to have the user interact with the system up to a point as late in the total process as possible. Lancaster found that interaction by the user after his having seen the results of a preliminary or partial search is desirable (31, p. 189-90). The other approach is to move from the delegated, one-chance type search to the browsing type search of upper-level resources by the reference librarian on behalf of the user. With the development of on-line, real time computerized system for certain components of the network, facsimile transmission of text for other components, and other such uses of communication technology, it should be possible for the librarian to conduct such browsing type searches through a fairly large percentage of the network's resources (31, p. 191).

This seems to imply, as was outlined a few paragraphs above, a regional center of one sort or another where reference librarians are interacting with users at lower nodes and with resources at higher nodes (or with other specialized nodes). The design of communications configurations to achieve such a process is a very complex matter, and one hopes a matter to be treated by this conference.

The expanded financial and user group base offered by networks should affect greatly the delivery of information in answer to user needs. At present in most network operations there is a separation (physically, or at least in terms of response time) between the store of information itself and the bibliographic and directory access devices thereto. This prevents the kind of smooth and fast interaction between the components of the network outlined above (48, p. 559). Often after having identified a document with a high potential for answering a user's needs, it is a matter of days before the network can deliver it to the user. The delivery service by truck and other surface means that are a common feature of present library systems have cut this to a matter of hours in some instances, but even this is frequently too long.

Technology seems to be developing along several lines that have application to this problem. Various electrical means of transmitting information, some of which might be discussed in other conference papers, are under development. High priority should be given to testing their applicability to information network problems. Such studies as that for METRO in New York on the possibilities of video information

transfer systems for libraries and information centers offer promise (41). Others will undoubtedly be needed.

Also, network development should make it feasible for a great many more local outlets to deliver information that has been interpreted or "repackaged" to meet the needs of specific users and user groups. The distinction between simply disseminating documents and the recasting of information to adapt it to the needs of users, as well as the case for the necessity of the latter, has been well made by the Committee on Scientific and Technical Communication (35, p. 43-49). Most library outlets, because of basic philosophical orientation, or because of inadequate staff depth and expertise, have not gone much beyond providing information as it appears in retrieved documents. Some libraries, particularly those serving specialized client groups, do offer such services, and others might if the user groups to whom they were relevant were expanded. In addition, institutions intended for such analysis, reviewing, and repackaging (increasingly referred to as information analysis centers) have development in rather large numbers and will probably increase in numbers. The library network can make the products of these libraries and information analysis centers widely available and can tap the expertise of such institutions for the benefit of local users. The EDUCOM proposal for an agricultural sciences information network outlines well the role of the information analysis centers component in the network (17, p. 47-55).

The phase of the reference process that has been characterized as relevance and pertinence evaluation has been dramatically affected

by network development so far. As mentioned above, in present network operations a great deal of the reference process is delegated from user to system and among various nodes of the system. This means that in all too many cases the material ultimately retrieved, after a great deal of system effort and expense, is not pertinent to the user's needs. Frequently, too, the user has waited so long for the material that he is unwilling to initiate another search.

The use of rapid communications capabilities to improve the interactive ability of networks has been mentioned several times before. As indicated, this ability will allow the user to make preliminary pertinence judgments along the way, to have these acted upon by the reference librarian, and to have a quicker response to his evaluation of the ultimate output. As with the single-unit system, it is important that the network have a feedback mechanism whereby such pertinence judgments can be used for the improvement of the network.

The reference process will probably alway involve some amount of relevance judgment by the reference librarian on behalf of the user, particularly in the network, as pointed out earlier in the paper. Experimental evidence suggests that for both the information system specialist and the non-user subject specialist, the accuracy of such judgments is far less than 100% accurate (15, p. 115). There is, of course, a great deal of research currently being done on relevance judgment which might eventually improve this situation. It is this author's belief that our inability to make accurate relevance judgments

on behalf of users rests on an inability to characterize user needs and information units effectively, a requisite to predicting relationships between them.

Summary and Conclusion

This paper has attempted to discuss the impact of information network development on the reference process. The reference process typical of a single-unit library was outlined as a process wherein the reference librarian interacts with the user to clarify his information need and then, in turn, searches the resources of the library in a browsing mode, interacting frequently with the user for assessments of pertinence. One of the main limiting factors here has been the relatively small amount of informational material the single library can bring to bear on a reference problem. The development of multi-library systems has increased greatly the amount of material to which the user has legal access through his local library. This phase of library development has reached some maturity.

To change this merely legal access to effective access, the user again needs the services of the reference librarian. Unfortunately, these services have been hampered by factors of distance and time that, have accompanied multi-library system development. The librarian having direct contact with the user often lacks the knowledge, skill, and bibliographic resources necessary for adequately receiving and referring the request. The librarian with the requisite skill and proximity to resources is separated from the patron and the pertinence judgments that he can offer. Finally, the materials identified as

potentially useful to the requester may take days (or weeks) to reach him. The paper has indicated that the effective use of modern communications technology can allow the reference process in the network to approximate that of the single-unit system (in its interactive, quick-response nature), while helping the user to make effective use of a very wide spectrum of information resources.

However, a problem which has hampered the effectiveness of reference service in the single library will also hamper the development of reference services in the network. This is our lack of basic knowledge concerning information, its users, and the uses to which it is put. At several points in the discussion above the inhibiting effect of this situation on one or another phase of the reference process has been mentioned. (Many of the other very serious problems to be solved in network reference services, e.g., compatability and hardware and software configuations, have not been mentioned or have been glossed over because they are topics to be treated in other conference papers.)

Paisley has correctly identified the basic difficulty in this area as a lack of abstract concepts on which fruitful theories and hypotheses can be based (40, p. 24-25). With regard to users of information, we have not been able, as Paisley says, to move beyond the labels such as "basic" versus "applied,""scientist" versus "technologist," and "formal" versus "informal" (40, p. 24). Concerning information itself, there have not been sufficient typological or taxonomic investigations to move beyond the labels used in reference book lists (handbooks,

encyclopedias, dictionaries, etc.) or gross format labels (book, journal, film, etc.). Thus, one wishing to hypothesize regarding the relationships between user characteristics and information use is lacking in concepts and constructs for both the independent and dependent variables.

To paraphrase Paisely again, network designers can incorporate knowledge of information users and uses into network planning in two ways. First, they can be studied after the fact, to explain why the system is not working well. Second, such knowledge can become the network's foundation, and the later developmental stages can be tested to see if they rest securely on this foundation. Unfortunately, early and sustained attention to concepts and theories concerning information, its users and uses will be necessary before this second approach can be effectively applied.

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